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REPORT

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UNIVERSITY OF ILLINOIS

—OF—

School of Mines and Metallurgy,

—AT—

ROLLA, PHELPS COUNTY, MO.,

For the Year Ending June 12th, 1884.

[From the Missouri University Catalogue, 1883-4.]

JEFFERSON CITY:
STATE JOURNAL COMPANY, STATE PRINTERS.
1884.

Compliments of

CHAS. E. WAIT,

DIRECTOR SCHOOL OF MINES.

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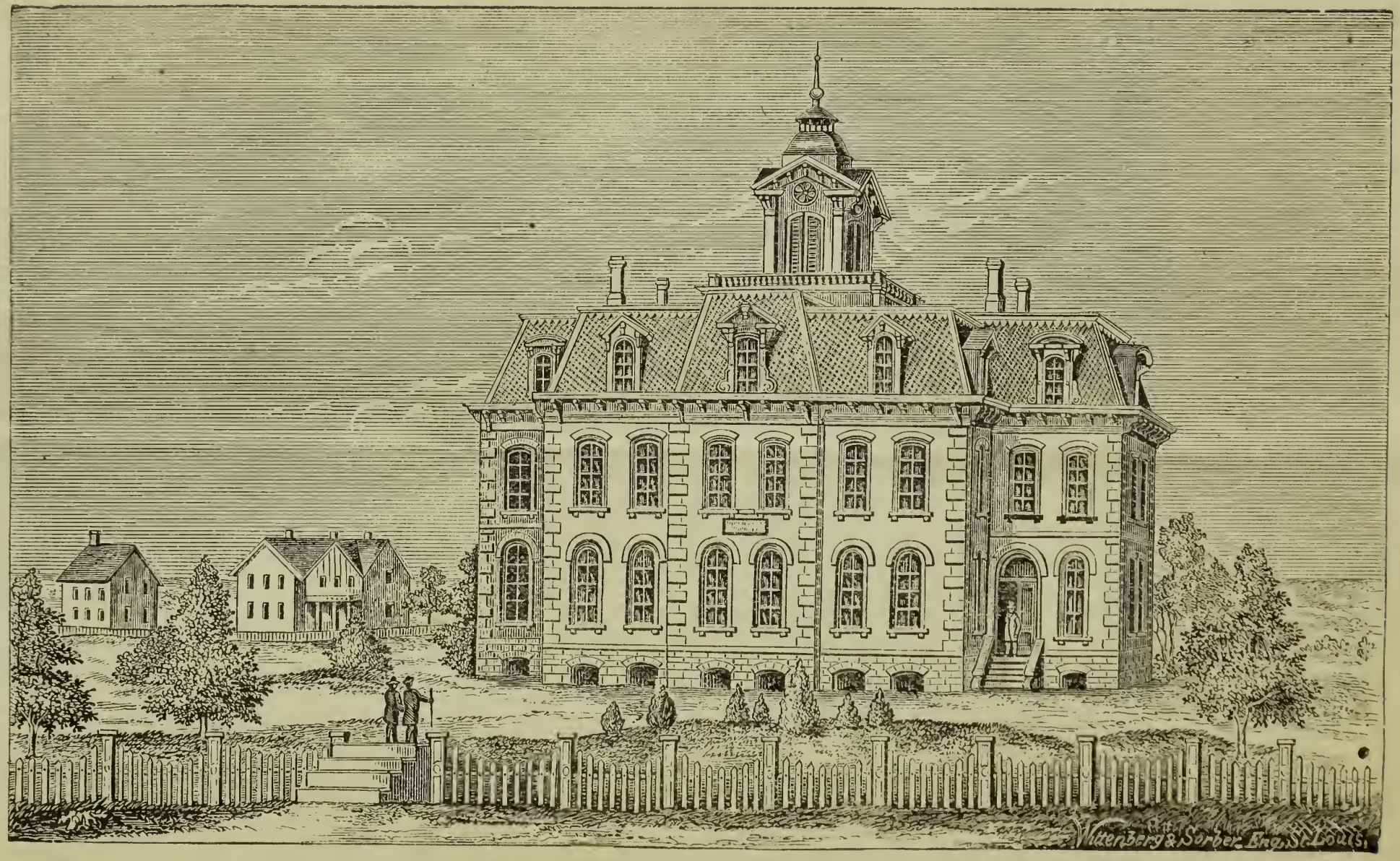

SCHOOL OF MINES AND METALLURGY, ROLLA, PHELPS CO., MO.

MISSOURI UNIVERSITY.

School of Mines and Metallurgy,

ROLLA, PHELPS COUNTY, MISSOURI.

ANNOUNCEMENT AND REGISTER,

FOR THE YEAR ENDING JUNE 12TH, 1884.

BOARD OF CURATORS.

HON. WM. F. SWITZLER	Columbia	Term expires Jan. 1, 1885.
JAMES R. ESTILL	Howard Co.	
JOS. CAMPBELL	Rolla	
HON. JAMES S. ROLLINS, LL. D	Columbia	Term expires Jan. 1, 1887.
CHARLES C. BLAND, ESQ	Rolla	
NORMAN J. COLMAN, EX-LIEUT. GOV.	St. Louis	
JOHN S. CLARKSON, A. M	Columbia	Term expires Jan. 1, 1889.
JERRE C. CRAVENS, ESQ	Springfield.	
JUDGE JAMES LINCOLN	Clay Co.	

OFFICERS OF THE BOARD.

HON. JAMES S. ROLLINS, LL. D ..... President.

JERRE C. CRAVENS, ESQ ..... Vice-President.

ROBERT L. TODD, Secretary. RICHARD BEVERLY PRICE, Treasurer.

SCHOOL OF MINES.

EXECUTIVE COMMITTEE.

JUDGE CHARLES C. BLAND, Chairman ..... Rolla.

JOS. CAMPBELL ..... Rolla.

JERRE C. CRAVENS, ESQ ..... Springfield.

C. H. FROST, Treasurer ..... Office at Rolla.

PROF. R. W. DOUTHAT, Secretary Executive Committee.

FACULTY.

SAMUEL S. LAWS, LL. D.,
President.

CHARLES E. WAIT, C. E., M. E. (Director),
Professor of Analytical Chemistry and Metallurgy.

MAJ. GEO. D. EMERSON, M. E.,
Professor of Civil and Mine Engineering and Graphics.

ROBT. W. DOUTHAT, A. M., PH. D.,
Professor of Languages, Principal of Preparatory Department.

GEORDIE Z. WHITNEY, A. M., LL. B. (Univ. Mich.),
Professor of Mathematics, and Secretary of the Faculty.

VICTORIA G. CONKLING,
Assistant in Preparatory Department, and Recording Secretary.

PROF. GEORDIE Z. WHITNEY,
Librarian.

GRADUATES.

Duncan, Gustavus H., C. E.	1874	Boulder, Col
Gill, John H., C. E.	1874	U. S. Eng. Dept., Washington, D. C.
Pack, John W., M. E.	1874	Assayer, Helena, Montana.
Deegan, Francis J., C. E.	1875	Surveyor for St. L. & San Francisco R. R.
Hare, Almon W., M. E.	1875	Leadville, Col.
Emerson, Cyrus H., C. E.	1876	Dennison, Texas.
Garvens, Oscar E., M. E.	1876	Lead City, Dakota Ter.
Greason, John D., M. E.	1876	Druggist, Ironton, Mo.
McGrath, John D., C. E.	1876	U. S. Coast Survey.
Minger, William C., M. E.	1876	Boulder, Col.
Ohmann-Dumesnill, A. H., M. E.	1877	M. D., St. Louis.

Pack, James A., M. E.	1877	Assayer, Butte City, Montana.
Millsaps, Thomas H., C. E.	1877	
Brown, Wilton R., M. E.	1878	Assayer of Shakespeare Gold and Silver Min. Co., Shakespeare, Grant county, New Mexico.
Grabill, Lee R., M. E.	1878	Assayer, New Mexico.
Bean, William Y., C. E.	1878	Engineer, Missouri Pacific R. R.
Coppedge, Lindsay L., C. E.	1878	Engineer, Missouri Pacific R. R.
Winters, Chas. F., M. E.	1879	Assayer, New Mexico.
Hoyer, Rudolph C., C. E.	1879	U. S. Eng. Dept., City of Mexico.
Carson, Arthur C., M. E.	1880	Assayer, Butte City, Montana.
Smith, Lorin X., M. E.	1880	Mining Engineer, Silver City, N. M.
Smith, Lorin X., C. E.	1881	" " " " "
Summers, Edward B.	1881	Engineer, U. S. Topog. Survey.
Wishon, Walter W.	1881	Colorado Springs, Col.
Gibb, Frank W., C. E., M. E.	1882	Mining Engineer, Silver City, N. M.
Painter, W. R., C. E.	1882	Colorado.
Schrantz, A. B., C. E.	1882	Engineer, U. P. R. R.
Van Devander, H. N., C. E.	1882	Engineer, Frisco Railway.
Ross, B., M. E.	1882	Houston, Mo.
Davis, Floyd, C. E., M. E., Ph. B.	1883	Professor Mechanics and Metallurgy, Va. Ag. and Mech. College, Blacksburg, Virginia.

COURSES OF STUDY.

The work of the School is done in two departments: Preparatory and Technical.

PREPARATORY DEPARTMENT.

Entrance Examinations.

For the benefit of persons who have not enjoyed such facilities elsewhere, a Preparatory Department has been established. The School of Mines does not undertake to do the work of the Common School, therefore all candidates for admission will be examined as follows:

Arithmetic: Fundamental rules; fractions, common and decimal; denominate numbers; percentage including interest.

Grammar: Orthography; principles of punctuation; use of capitals; etymology; construction of easy sentences.

Geography: Descriptive, with special reference to Europe and the United States.

Composition: Two pages on an assigned topic, written in the presence of the examiner.

COURSE OF STUDY.

Junior Class.

First Term.		Second Term.	
Arithmetic	5 hours per week.	Algebra (c)	5 hours per week.
Gram. and Word Anal.	5 hours per week.	English Analysis	5 hours per week.
U. S. History.....	3 hours per week.	Physical Geography.	5 hours per week.
Eng. Exercises and Elocution	5 hours per week.	Drawing	.....
Drawing	.....		

Senior Class.

First Term.		Second Term.	
Algebra (b).....	5 hours per week.	Algebra (a)	4 hours per week.
Geometry (b) Plane ..	5 hours per week.	Geometry (a)	4 hours per week.
Physics (b).....	5 hours per week.	Chemistry.....	4 hours per week.
Drawing	.....	Physics (a).....	4 hours per week.
		Drawing	.....

Rhetorical exercises (compositions, readings, etc.,) weekly throughout the entire course.

The satisfactory completion of this course shall admit to the Technical Department, without further examination, and shall also entitle the student to a certificate, should he desire it, showing the studies pursued and the grade in each.

For the benefit of those who may find it impossible to enter at the opening of the year, the Arithmetic and Grammar of the first term of the Junior year will be offered the second term also, if called for by a sufficient number of persons.

Optional Studies

Open only to those who have completed satisfactorily all the work of the Junior year, except Algebra (c). These classes will be organized when called for by at least five students, sufficiently prepared for the work upon which they desire to enter: Latin; German; Spanish; English Literature; Anatomy, Physiology and Hygiene; Civil Government; Rhetoric; Logic; Political Economy; Mental and Moral Philosophy.

TECHNICAL DEPARTMENT.

Candidates for admission will be examined in all the studies of the preparatory course.

FOR THE DEGREE OF MINING ENGINEER.

	First Term.	Second Term.
First Year.	Chemical Philosophy. Blowpipe Analysis. Trigonometry. Field Practice. Drawing.	Chemical Technology. Qualitative Analysis. Descriptive Geometry. University Algebra. Land Surveying.
	First Term.	**Second Term.**
Second Year.	Quantitative Analysis. Metallurgy. General Geo'y and Calculus. (*b*) Higher Surveying. Shades and Shadows. Drawing. Determinative Mineralogy. Geology.	Quantitative Analysis. Metallurgy. Mine Engineering. General Geom'y and Calculus. (*a*) Steam Engine. Assaying.
	First Term.	**Second Term.**
Third Year.	Quantitative Analysis. Metallurgy. Rational Mechanics.	Quantitative Analysis. Graduation Thesis.

FOR THE DEGREE OF CIVIL ENGINEER.

	First Term.	Second Term.
First Year.	Chemical Philosophy. Blowpipe Analysis. Trigonometry. Field Practice. Drawing.	Chemical Technology. Qualitative Analysis. Descriptive Geometry. University Algebra. Land Surveying.
	First Term.	**Second Term.**
Second Year.	Roads and Railroads. Higher Surveying. Topographical Drawing. General Geometry and Calculus. Shades and Shadows. Astronomy. Geology.	Mine Surveying. Steam Engine. General Geometry and Calculus. Civil Engineering. Assaying.
	First Term.	**Second Term.**
Third Year.	Field Work. Railroad Location. Mechanism. Rational Mechanics. Drawing.	Practical Topography. Applied Mechanics. Drawing. Graduation Thesis.

The courses of study will be rigidly enforced upon all students, candidates for the degrees of the Institution. The degrees awarded are Civil Engineer (C. E.) and Mining Engineer (M. E.)

Certificates and diplomas are issued only at the public commencement.

DEPARTMENTS OF INSTRUCTION.

MATHEMATICS.

PROFESSOR WHITNEY.

Inasmuch as the student of Engineering can scarcely read the primers of his profession without a considerable knowledge of mathematics, and in recognition of the importance of mathematical studies from an educational as well as from a professional point of view all the work mentioned below is required of candidates for the degree of Civil Engineer, and all except course 14 is required of candidates for the degree of Mining Engineer.

While special attention is given to the mental discipline of the student in the logical development of the mathematical processes as *arguments*, the great practical end of preparing him to attack the problems of physical science by the Mathematical method with its enormous advantages is never for a moment lost sight of.

The attention of those contemplating entering upon the studies of the first year is called to a remark of Prof. Ficklin, in which he says: "Imperfect preparation in Algebra is so common as to compel the conviction that sufficient attention is not given to this branch of mathematics in many of the preparatory schools of the State. Its importance cannot well be over-estimated."

It is especially desirable that the pupil have well defined notions of the nature and signification of exponents of every form, and that he be able to give a logical reason for every process involving their use.

The studies of this department are as follows:

IN THE PREPARATORY COURSE.

JUNIOR YEAR.

First Term.

1. Arithmetic (completed), Barnes' National by Ficklin, 5 hours per week.

Second Term.

2. Algebra (c, beginning), Olney's Complete, 5 hours per week.

SENIOR YEAR.

First Term.

3. Algebra (b), five hours per week.
4. Geometry (b) (Plane), Olney, five hours per week.

Second Term.

5. Algebra (a) (book completed), four hours per week.
6. Geometry (a), Solid and Spherical, four hours per week.

IN THE DEGREE COURSES.

First Year.

First Term.

7. Trigonometry, Olney, four hours per week.

Second Term.

8. Univ. Alg. (from Part III) Olney, four hours per week.
9. Descriptive Geometry, Church, four hours per week.

Second Year.

First Term.

10. General Geometry and Calculus, Olney, four hours per week.
11. Spherical and Isometric Projections, Shades and Shadows, four hours per week.

Second Term.

12. General Geometry and Calculus, four hours per week.

Third Year.

First Term.

13. Rational Mechanics, Dana, four hours per week.

Second Term.

14. { (14 a) Advanced Gen. Geometry and Calculus / (14 b) *or*, Aplied Mechanics. } four hours per week.

Studies must be taken in the order indicated above, except that course 8 may follow immediately after course 5, and courses 10, 12, 13 and 14 may be taken before courses 9 and 11. In course (14 a) Geometry of three dimensions is taken up, followed by advanced work in the Calculus, including some discussion of differential equations.

Course (14 b) embraces the more important applications of the principles of mechanics to structures and machines. Rankine used as the text, with lectures and references.

As elementary Algebra and Geometry lie at the basis of any substantial attainments in mathematics as well as in engineering, great care is taken to secure a thorough mastery of these subjects in the preparatory course.

Information in regard to advanced work for graduate students may be had upon application to the Professor in charge of this department.

GENERAL CHEMISTRY.

Professor Wait.

Instruction in this department is given to two classes—the Preparatory, and First class.

Preparatory Class.

In this class, chemistry is commenced with the second term, and is continued throughout the term. The class is taught the elements of the subject, being fully illustrated by instructive and interesting experiments, and such information is given, aided by suitable text-books, as will prepare them for the higher classes in chemical Philosophy and Chemical Technology, and also for entering upon laboratory work, which is commenced the following year.

First Class.

(Text-Books), Chemical Philosophy (Cooke), Chemical Technology (Wagner).

The duties of this class continue throughout the year; there are four recitations each week. Chemical philosophy is first introduced and continued through the first term. The application of arithmetic to chemistry is given a prominent place in this class. Students are required to perform numerical examples, thereby fitting themselves for the solution of many questions constantly occurring in the advanced department of analytical chemistry.

The second term is given to a course in Chemical Technology. Among the subjects discussed in this course are: Products of Chemical industry; Glass; Mortars; Cements; Paper; Sugar; Wine making; Oils; Paints; Dyeing and Printing; Bleaching; Gas; Fuel, etc., etc.

ANALYTICAL CHEMISTRY.

Professor Wait.

First Year.—Blow-pipe Analysis (Elderhorst's Manual); Qualitative Analysis (Fresenius).

Second Year.—Qantitative Analysis (Fresenius); Quantitative Analysis (Fresenius); Assaying (Mitchell).

Third Year.—Quantitative Analysis (Fresenius).

Instruction in this Department is thoroughly practical, and extends throughout the first, second and third years. There is a commodious laboratory, supplied with gas and necessary apparatus, also balance room and mineral collection. In the basement is the new assay laboratory, which has been recently fitted up; three new furnaces for the assay of gold, silver, lead and copper ores have been placed in position and other apparatus provided to make this department complete in every respect.

First Class.

The students in this class spend four hours each day at practical work; each one is provided with a working table, apparatus and chemical reagents.

The course is begun with blow-pipe work; the student is made acquainted with the reaction of known bodies, and he is then required to perform the experiments for himself, thus becoming familiar with the behavior of such bodies before the blow-pipe, and enabling him to detect the composition of substances given to him for identification.

Qualitative analysis is also taken up, and is taught by lectures and experiments, the student being required to repeat at his working table, the tests for bases and acids which have been shown to him. After passing through a systematic course of qualitative analysis, he is required to analyze and report upon substances given to him, including mixtures of salts, also alloys, ores of lead, copper, zinc, antimony, iron, etc., etc., soils, insoluble sillicates and mineral waters.

Second and Third Classes.

Quantitative analysis constitutes the work of these classes. Those students who have completed satisfactorily the work given to them during the first year, and who have passed a practical examination, lasting one week, are allowed to commence quantitative analysis.

The quantitative course includes analyses, either partial or complete, of the following series, each estimation being, at least, duplicated:

(*1) *Zinc Sulphate;* (2) *Barium Chloride;* (3) *Alum;* (4) *Chrome Alum;* (5) *Sulphate of Iron and Ammonia;* (6) *Blue Vitriol;* (7) Calcite; (8) Calamine; (9) Galena; (10) Chalcopyrite; (11) Orthoclase; (12) Kaolin; (13) Hematite; (14) Pyrolusite and Chlorine, valuation; (15) Soda Ash, valuation; (16) Bleaching powder, valuation; (17) Cerusite; (18) Smithsonite; (19) Blende; (20) Coal, proximate; (21) Coal, ultimate and heating power; (22) Stibnite; (23) Realgar; (24) Blast furnace slag; (25) Lead furnace slag; (26) Pig iron; (27) Bismuth litharge; (28) Commercial lead; (29) Spelter; (30) Regulus; (31) Beryl; (32) Illmenite; (33) Chromite; (34) Saltpetre soil; (35) Mineral water.

Besides this course, there is the usual practice in the fire assay of the ores of lead and silver, of argentiferous and auriferous native compounds and artificial products, and in the docimastic valuation of the ores and the most prominent metals.

A short course in quantitative blow-pipe analysis is required. Also a course in determinative mineralogy.

Special students may pursue, at their discretion, the study and analysis of any class of ores or metallurgic products. Young men, who have neither the time nor means to spare, to take the full course, may accomplish much in the way of chemical analysis by devoting their entire time to it during the course of a single year.

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*Those in italics are *partial* analyses.

METALLURGY.

Professor Wait.

The instruction in this department is given by lectures, supplemented by laboratory practice, and is illustrated by diagrams, models and specimens. The course is introduced by zinc, and is followed by lead, silver, nickel, mercury, copper, iron, antimony and gold. The principles of furnace construction, of slag formation, and of general metallurgical operations, are discussed throughout the course, and special illustrations are given of all the methods described. The students are required to solve problems involving the discussion of the desirable methods of treatment of ores of stated composition, under given economical conditions, and to accompany the solution with plans and estimates for works to carry out the method. In the lectures and other exercises of this department, full cognizance is taken of the peculiar economic conditions surrounding metallurgical industry in this country, and especial reference is had to the staple metallic products of Missouri—iron, lead and zinc. Studies are made of the local iron establishments, and excursions are made to other iron works, as well as to those at which lead and zinc ores are practically treated.

GEOLOGY AND MINERALOGY.

In the second year, the students have recitations, lectures and laboratory exercises, in the determination of a series of fifty-five well selected mineral species, with special reference to the ores of the metals and their associated ganges. These exercises are followed by lectures and recitations (based on Dana's Manual) on dynamical and historical geology. The lectures on Lithology, and on mineral veins and ore deposits, together with an account of the chief geological features and modes of occurrence in the principal mining districts, complete the course.

CIVIL ENGINEERING.

Professor Emerson.

In this department, practical work in the field forms a prominent, and, as we believe, a somewhat distinctive feature. The use of instruments in the field, by all the students of Civil Engineering, begins with the second term of the first year, and is continued throughout the course. A complete familiarity with the manipulation of all the instruments in common use by engineers and land surveyors, is taught to the students by systematic practice, in the room and in the field. He is made familiar with the chain and all its capabilities; the needle compass, the solar compass,

the transit instruments, the leveling instrument, the sextant, the barometer, and the various tools used in drawing and plotting. Saturday and Monday of each week, are devoted to practice in the field, and where necessary, a long time is taken or excursions to the mines, furnaces, bridges and railroad constructions of the country.

The field practice consists of land and railroad surveying, by all the methods in use. Tracts of land, roads and streams are surveyed and plotted; contours of the adjacent country are made with the leveling instrument, the barometer, etc.; railway curves are calculated and set out upon the ground, earthwork is measured and estimated from the embankments and excavations of the railroad. A general system of triangulation of the country about Rolla, is begun from a base line carefully laid by the students, which will be extended from time to time for their instruction.

Such parts of astronomy as relate to land surveying or engineering, are carefully studied, and are illustrated by stellar and solar observations.

A general course of descriptive engineering, on the basis of Mahan's Civil Engineering, revised, by Professor Wood, runs through the second term of the second year.

Gillespie's treatise upon Roads and Railroads, forms one of the studies of the Engineering course.

GRAPHICS.

Professor Emerson.

During the preparatory course, the students are instructed in the elements of drawing, with pen and pencil, according to the principles contained in Chapman's Drawing-book. They are also practiced in freehand drawing. These exercises develop the special tendencies of the student, and enable the Professor to judge in what direction his greatest strength lies, and where his weak points most need to be reinforced.

During the first year the practice is in topographical drawing, with pen and India ink, representing the lines of contour of the earth's surface, showing the bounding curves which would limit the surface in case of a gradual rise of water; taken at every 5, 10 or x feet. The hatching lines of declivity are drawn; also, the various conventional representations of surface. The students are exercised in a carefully organized method of drill in printing, in order to acquire a rapid system of lettering—of essential importance in finishing maps, problems, title pages and mechanical drawings. There is also a careful study of the true standards of the three colors, with their secondary and ternary combinations, simultaneous contrasts, harmonies, unisons, aerial perspective, and the important practical application of laying on flat tints. This is followed by applications to colored topography, etc.

In the second year exercises are given in the construction of problems in descriptive geometry, and in shades, shadows and perspective. The problems are drawn with pen and India ink on demy drawing paper, and are constructed on mathematical

principles, displaying all the difficult problems of the intersection of curved surfaces, and the representations of warped surfaces having two or three directrices.

There are also required drawings of bridges, furnaces, machines, their shadows and perspective, as they would appear to the eye, at a finite distance from the perspective plane, mathematically constructed and properly colored.

Those who possess the requisite taste for such subjects, may be exercised in pen, India ink and color drawings of landscapes, figures, etc., and be led to apply their acquirements to natural history.

MINE ENGINEERING.

Professor Emerson.

This is taught entirely by lectures. The subjects of systems and attack and exploitations of mineral deposits; of shafts, adits and levels; timbering of mines; subterranean transportation, hoisting, pumping, surface transportation, and mechanical concentration, are considered in elaborate detail.

The course is fully supplemented by extended field practice, the important parts of the civil engineering course, and by extended instruction in assaying and analytical chemistry, and in drawing plans and sections of mines, and practical work.

MECHANISM.

Professor Emerson.

An extended series of lectures is given upon this important subject, which is intended to be a descriptive epitome of the principles which govern, and the forms and mode of construction of machines used in all industrial pursuits, embracing prime movers, machines of transmission, and as much as is possible in the course of applied machinery.

Steam Engine.

A series of lectures is given, historical, descriptive and theoretical, of the steam engine, embracing all the varieties in use, and their special applications.

FEES, EXPENSES, ETC.

The fees for instruction, etc., at the School of Mines and Metallurgy, are the same as at the other departments of the University, viz: An annual entrance fee of $10, besides an assessment of $5 per term for incidentals and for the use of the

library. Special students are subject to the same charges; all laboratory students furnish their own blow pipes, platinum, crucibles and apparatus, silver and gold solutions, and pay for gas and fuel consumed and for apparatus damaged or broken.

A deposit of $5 per term covering the value of the apparatus and chemicals issued, is required to be placed in the hands of the Treasurer by each laboratory student. This deposit less the value of material consumed, is returned at the close of the year.

The exercises of the drawing room require also a small expenditure, annually, for materials. Text-books and all requisite materials for students can be procured in Rolla, either from dealers, or, in the case of chemical apparatus, from the school, at the usual rates.

A fee of $5 must be paid, before graduation, for the degree; a fee of $1 for the preparatory certificate.

Good boarding at places approved by the Faculty can be obtained at from $3.50 to $4.00 per week.

The following is a careful estimate of necessary expenses for a college year:

Tuition	$20
Contingent expenses for Laboratory	$20
Board, fuel, washing and lights from	$96 to $150
Books, stationery, etc	$8 to $20

ADMISSION.

For requirements, see Courses of Study, page 101.

Before matriculation or entrance upon the duties of the school, the treasurer's receipt for entrance fee and for the incidentals of the term [or a statement from the Director that the time of payment has been extended], and also certificates of examination giving the grade made in each study, and signed by the instructor conducting the examination, must be presented to the Secretary of the Faculty.

No student shall be entitled to have his name enrolled on the class register of any instructor, nor be admitted to any class as a member, until he shall have signed his name on the Secretary's book and received a certificate to that effect, stating the course for which he has entered.

ENTRANCE EXAMINATIONS will be held Monday and Tuesday, September 15 and 16, 1884, at which time all candidates for admission are expected to be present.

The collegiate year opens on the third Monday in September. There is no suspension of exercises other than for examination between the two terms of the year.

HISTORICAL, ETC.

The School of Mines and Metallurgy—a department of the University of the State of Missouri—is located at Rolla, Phelps county, on the line of the St. Louis and San Francisco Railroad, one hundred and thirteen miles southwesterly from St. Louis. The locality is pre-eminently healthful, is in the midst of an extensive and rapidly developing iron section, with districts abounding in lead and zinc deposits, within easy access, and thus affords excellent opportunities for the field study of some of the modes of occurrence of the ores of these metals, as well as for the practical investigation of their methods of treatment. Excursions for such purposes will constitute a prominent feature in the instruction of the advanced classes.

The institution was created by the legislative act of February, 1870, disposing of the Congressional grant of land for agricultural and mechanical colleges. It was formally opened November 23, 1871. The first class, of three members, graduated in June, 1874, having completed the full course. The thirteenth year of the Institution closes with this announcement and catalogue.

The design of the School of Mines and Metallurgy, in connection with the Agricultural College, is to carry out, to its amplest extent, the intention of the act of Congress, providing for education in the Industrial arts. This has been kept prominently in view in arranging the curriculum of the school, in the selection of its apparatus, in providing its equipment and in the organization of its Faculty. It is a school of Technology, with Civil and Mine Engineering and Metallurgy, as specialties.

The school is furnished with apparatus, instruments, and other appliances for practical instruction and demonstration. It has a supply of excellent surveying, engineering and drawing instruments, physical apparatus, embodying the newest forms for illustration and research, together with diagrams and models for the illustration of metallurgic processes and engineering constructions. The laboratories for analyses and assaying have been increased in working capacity, and are amply furnished with apparatus and reagents necessary for practical instruction, and for any line of chemical and metallurgical research. The library has been selected with special reference to supplementing the labors of the class and lecture rooms, and consists, therefore, largely of standard reference works on the physical sciences, mathematics and technology.

The class and other rooms of the building are comfortably furnished, well lighted and well ventilated. The first floor is occupied by the analytical laboratory, the chemical lecture room, and the room of the professor of geology. On the second floor are the public hall, library, engineering rooms; and in the third story are the rooms of the professor of mathematics, and rooms with ample accommodations for the Preparatory Department. The basement contains the assay furnaces and other appliances for metallurgical work. The laboratory is supplied with gas for the heat required in chemical analysis.

CALENDAR.

1884.

June 12th, Thursday, 10 A. M.	Annual Commencement.
September 15th, Monday	First Term begins.
September 15th and 16th	Entrance examinations.
December 19th, Friday	Close for Christmas Holidays.

1885.

January 6th, Tuesday, 9 A. M.	Exercises resumed.
January 26th, Monday	Examinations begin.
January 31st, Saturday	Examinations close.
February 3d, Tuesday, 9 A. M.	Second Term begins.
June 1st, Monday, 10 A. M.	Yearly examinations begi
June 11th, Thursday, 10 A. M.	Annual Commencement.

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